

and retarders on amylohydrolysis, there is no mention of Ford's recent work.

Cytase is stated not to occur in resting seeds, but it is present in small amounts in some.

In giving directions for the preparation of Schweizer's solvent for cellulose, the best method, that of dissolving metallic copper in ammonia through which a current of air is passed, is not mentioned.

The function of a critic is to criticise; but he is human, and hence prone to eulogise—or blame. In this case the reviewer can only yield praise. The work fills a void that botanical physiologists have long felt. The wealth of material dealt with is surprising, and the expenditure of labour must have been enormous. There is very little evidence of partiality, whether national or of other kind. The compass of the work is wide, and it is thoroughly up to date.

The reviewer was especially pleased with the general part. For the first time in a botanical work adequate stress is put on the importance of colloids as such, and on the necessity of knowledge of their nature for progress in physiology; and for the first time the principles of general chemistry are given the position due to them in a work of this class. To Prof. Czapek for having done this all botanical physiologists must remain indebted.

In the opinion of the reviewer the value of the work would have been enhanced by incorporation in it of curves illustrating the various processes described, and by citation of mathematical expressions wherever they have been proved or found to be applicable.

If the work should run through subsequent editions, as is most likely, it would certainly be best for different authors to be delegated for various parts, since with the rapid accumulation of material it will soon be impossible for a single author to deal adequately with a work of such dimensions.

F. ESCOMBE.

#### THE ELECTROMAGNETIC THEORY OF INERTIA.

- (1) *Mathematische Einführung in die Elektronentheorie.* By Dr. A. H. Bucherer. Pp. 148. (Leipzig and Berlin: Teubner, 1904.) Price 3.20 marks.
- (2) *Experimentelle Elektrizitätslehre.* By Dr. H. Starke. Pp. xiv+422. (Leipzig and Berlin: Teubner, 1904.) Price 6 marks.
- (3) *Leitfaden der Physik für die oberen Klassen der Realanstalten.* By Dr. F. Bremer. Pp. viii+294. (Leipzig and Berlin: Teubner, 1904.) Price 3.20 marks.
- (4) THE property of matter which has always been regarded as most fundamental is "inertia." This property is adopted as the measure of quantity of matter in dynamics, and the nearest approach to a complete explanation of a physical phenomenon is generally supposed to have been reached when the phenomenon has been shown to be due to the motion of particles possessing inertia. We may say, in fact, that the tendency of nineteenth century physics was

to give a purely dynamical explanation of everything. A striking example of this tendency is Maxwell's dynamical theory of the electromagnetic field.

In 1881 it was shown by Prof. J. J. Thomson that a particle charged with electricity possesses some inertia due to its electric charge in addition to the ordinary inertia of the particle. As the result of Kaufmann's measurements, we now know that all the inertia of an electron is of this electromagnetic kind. It is now further suggested that all matter is composed of electrons, so that all inertia is electromagnetic. Density, according to this view, is simply number of electrons per unit volume. Electromagnetic inertia, that is, all inertia, is due to the energy of the magnetic field produced by the moving charge of electricity. The energy of this magnetic field resides in the ether. According to Maxwell's dynamical theory, the electromagnetic energy of the ether is due to motion of parts of the ether, these parts possessing inertia. But the only kind of inertia which we really know is the inertia of matter, which is due to the electromagnetic action of the electrons of which matter is made up. If inertia is due to electrons, then if we ascribe to parts of the ether the property of inertia we ought to say that the ether contains so many electrons per unit volume. But the free ether is not supposed to contain any electrons; in fact, if we explain inertia by the energy of the magnetic fields produced by moving charges, then evidently to explain this energy by inertia in the ether is merely to argue in a circle. The position is, then, that inertia is explained in terms of the electromagnetic field, and that now some explanation of this field is required not involving inertia at all. So far, no such explanation has been offered. Larmor has suggested that the ether has an enormous density or inertia per unit volume, and that it moves along the lines of magnetic force. This explanation must evidently be abandoned if matter is regarded as made up of electrons having only electromagnetic energy, or else we must say that the ether has a sort of inertia, not the same as the inertia of matter, but like the kind of inertia matter was supposed to have before the electromagnetic theory of inertia was put forward.

To say this, however, is merely to ascribe to the ether a property the definition of which is that it explains what it is required to explain; it is, in fact, merely the old process of "explaining" a thing by inventing a name for its explanation. The properties of the ether, then, expressed by Maxwell's system of equations are at present without any explanation, but they have taken the place of inertia as the fundamental thing in terms of which phenomena are to be explained. In these circumstances the appearance of Dr. Bucherer's small volume on "Elektronentheorie" is exceedingly opportune. It contains a concise and readable account of Lorentz's splendid theory and of the electromagnetic theory of inertia. The introduction gives a short account of the properties of cathode rays and radium radiation, which, of course, are the properties of electrons on which the electronentheorie is based. Chapters i. and ii. contain a short account of Lorentz's theory for bodies at rest, and chapters

iii. to v. the theory for moving charges, vector analysis being used throughout. The remaining chapters deal with radio-activity, rotating charges, radiation from electrons, the Zeeman effect, the theory of Röntgen rays, aberration, and dispersion.

The mathematical theory of the properties of electrons appears to be well and clearly dealt with on the whole, and the author has managed to compress a great deal of information into a small space. English readers will probably feel that sufficient credit is not given to some English physicists to whom the initiation of the whole theory is really due. The parts of the book dealing with experimental facts and the theory of things outside the electromagnetic theory are rather superficial and sometimes erroneous. For example, it is stated that the radio-activity of radium emanation diminishes very rapidly with rising temperature, and that this can be deduced thermodynamically from the large amount of energy evolved. This glaring error shows conclusively that the author's acquaintance with the literature of radio-activity is of the slightest. The book will no doubt be welcomed by many anxious to learn about the new views on inertia and matter, and to such it should prove useful.

(2) Dr. H. Starke's book on experimental electricity and magnetism contains a very up-to-date and excellent elementary account of the subject. The explanations of many of the experiments described seem scarcely full enough to enable students actually to work from them, but it is evidently not intended that they should do so without further help. Many good diagrams of modern forms of apparatus are given.

(3) Dr. F. Bremer's book on physics for the upper classes in schools is a rather bad type of school textbook in which it is sought to make things suitable for school children by giving very short and scrappy accounts of everything. It looks like a book which might be useful to a student with a very good memory in cramming for an elementary examination in physics. He might get through the examination, but he would have learnt nothing worth knowing.

HAROLD A. WILSON.

#### A BOTANIST'S RECREATIONS ON THE RIVIERA.

*Streifzüge an der Riviera.* By Eduard Strasburger. Revised edition, with 87 coloured illustrations by Louise Reusch. Pp. xxvi+480. (Jena: Gustav Fischer, 1904.) Price 10 marks.

THE Riviera has of recent years become regarded as the playground of wealthy people whose only idea of enjoyment consists in spending hours in the unhealthy atmosphere of the casino at Monte Carlo, raising dust with a motor-car, dining at separate tables, or sitting in an hotel lounge. But such people see nothing of the *real* Riviera, with its wealth of wild flowers, its charming rock villages perched on heights, its olive, orange, and lemon groves, and its torrent beds up which one scrambles from rock to rock, passing a succession of pretty pictures each prettier than the previous one. On first reading Prof. Strasburger's book, the reviewer formed the impression that the descriptions were too prosaic and wanting in sunshine.

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It cannot be said that the author has succeeded in giving that warmth of colour to his account which characterises Mr. Casey's charming book. But since that impression was formed the present writer re-visited the Riviera, and the feature which he most noticed was how exactly every minute detail tallied with Prof. Strasburger's descriptions. The information contained in this book is just what is wanted to make a visit to the "Côte d'Azur" both enjoyable and instructive.

A large proportion of the text is taken up with historical accounts of the various cultivated plants and trees growing in the district. The most characteristic vegetation of the lower valleys—the vine, orange, lemon, olive, fig, cypress, and palm—is largely the result of "alien immigration." Before the hillsides were carefully terraced and cultivated they were overgrown with small scrub or "maquis" (Italian "macchia") consisting of pines, rosemary, myrtle, tree heath, three species of cistus, mastic, juniper, the characteristic spiked lavender (*Lavandula stoechas*), the remarkable spiny euphorbia (*E. spinosa*), and a number of other plants too numerous to mention. The aromatic perfume of many of these plants is one of the most salient features of the "maquis." In Prof. Strasburger's description of this characteristic undergrowth, the word "Duft" (perfume) occurs over and over again. It is only after walking through such vegetation that one realises that this very repetition makes the description all the more accurate and realistic, and readers of the book will do well to bear in mind the fact that each occurrence of the word usually refers to a different scent. Prof. Strasburger's descriptions of the "maquis" mostly refer to Antibes, where a considerable area of this primitive vegetation still remains untouched. In many places along the coast the "maquis" is being rapidly cut down to make room for unlovely vineyards, and the face of the country is being made less beautiful.

Considerable space is devoted to a description of the gardens at La Mortola, and the scent manufactories at Grasse also occupy many pages. In reading these descriptions one cannot help regarding the author somewhat in the light of a walking encyclopædia. He gives long digressions on the manufacture of chemical perfumes in connection with Grasse, and he makes his account of Sir Thomas Hanbury's garden the opportunity for giving much historical information about many economic plants such as the tea, coffee, and cocoa plants the sugar-cane—and, thence, the introduction of beet-sugar, the ebony and the camphor tree—which can hardly be regarded as the characteristic vegetation of the district. On the other hand, several interesting features are mentioned which a casual visitor might overlook. The characteristic flora of Hyères and the comparative absence of dust in the Esterel mountains are associated with the remarkable difference of geological formation as compared with the more frequented and fashionable but dustier winter stations in the limestone districts. The nightly concert of green frogs to which the author alludes is a sound which brings the Riviera vividly back to everyone who has heard it.

On the whole, Prof. Strasburger seems to have devoted most of his attention to studying the plants